# Public Health in China: The Shanghai CDC Perspective

The establishment of the Shanghai Municipal Center for Disease Control and Prevention (Shanghai CDC) in 1998 marked a significant step forward in improving public health in China. The Shanghai CDC, which was based on the example of the US Centers for Disease Control and Prevention (US CDC), was the first such center to be established in China and can be considered a model program. In fact, it was the precursor to the Chinese Center for Disease Control and Prevention (China CDC), which was created in Beijing in January 2002, and to similar entities in 28 province-level regions in China. The creation of these centers reflects much more than mere organizational restructuring. It was a policy response to the shifting of disease patterns, perception of disease, and governmental changes in China.

## BACKGROUND

Over the last 50 years, the life expectancy of China's citizens has increased significantly, and mortality rates, particularly those related to infectious disease, have declined. Although life expectancy in China varies by province, municipality, and region, on average, people are expected to live to be 70 years old.[1] In Shanghai, that figure is even higher—up from an average of about 58 years in 1957 to about 79 years in 2001, quite similar to the pattern seen in the developed nations.[2] Thus, not only are people living longer, but the kinds of health problems they face are also different from those faced in the past.

Shanghai is one of the 4 municipalities that have an independent government structure and report directly to Chinese central government. It is divided into 19 administrative areas (18 districts and 1 county). In 2001, Shanghai's total population was slightly greater than 16 million (including 3.05 million migrant workers from other provinces). The birth rate is 4.35 per 1000 and the mortality rate is 7.05 per 1000, resulting in a negative natural growth rate of 2.70 per 1000. People aged 60 years and older constitute 18.60% of the population; in certain communities in Shanghai, people aged 60 years and older constitute as much as 24% of the population. In 2001, the infant death rate was 5.71 per 1000, and the maternal death rate was 8.95 per 100 000.

A review of the 10 leading causes of death in Shanghai reveals that infectious disease is no longer the leader, as was the case in 1952 (Table 1). By 2001, infectious disease had fallen to seventh place, accounting for only 2.3% of deaths. Whereas cardiovascular and cerebrovascular diseases accounted for about 9% of deaths in 1952, they were the number one killer in 2001, when they were responsible for approximately 32% of all deaths. Similarly, neoplasms accounted for 3.24% of all deaths in 1952 but nearly 50 years later ranked second, responsible for 29.34% of deaths. Essentially, neoplasms and cardiovascular and cerebrovascular diseases now account for at least half of all deaths in Shanghai. Furthermore, other public health concerns, such as injury, diabetes, and mental health problems, create significant health burdens in the municipality.

Of the infectious diseases that once dominated public health in China, 12 (plague, tickborne encephalitis, smallpox, relapsing fever, scrub typhus, Dumdum fever, diphtheria, anthrax, schistosomiasis, brucellosis, typhus, and poliomyelitis) have been eliminated in Shanghai. For example, there have been no cases of

**TABLE 1—Ten Leading Causes of Death, Shanghai, China, 1952–2001**

| | 1952 | | 1972 | | 1992 | | 2001 | |
|---|---|---|---|---|---|---|---|---|
| Rank | Cause | Deaths, % | Cause | Deaths, % | Cause | Deaths, % | Cause | Deaths, % |
| 1 | Infectious disease | 36.98 | Circulatory system disease | 32.19 | Circulatory system disease | 30.40 | Circulatory system disease | 32.13 |
| 2 | Circulatory system disease | 9.06 | Neoplasm | 27.06 | Neoplasm | 25.26 | Neoplasm | 29.34 |
| 3 | Digestive tract disease | 5.93 | Respiratory disease | 10.09 | Respiratory disease | 19.90 | Respiratory disease | 14.23 |
| 4 | Respiratory disease | 5.29 | Digestive tract disease | 5.70 | Injury | 6.91 | Injury | 6.25 |
| 5 | Injury | 5.04 | Infectious disease | 5.56 | Digestive tract disease | 3.72 | Endocrine system disease | 2.95 |
| 6 | Stillbirth | 3.71 | Injury | 5.35 | Infectious disease | 2.38 | Digestive tract disease | 2.77 |
| 7 | Neoplasm | 3.24 | Genitourinary disease | 1.75 | Mental disease | 2.18 | Infectious disease | 2.31 |
| 8 | Endocrine system disease | 2.59 | Nervous system disease | 1.41 | Endocrine system disease | 1.84 | Mental disease | 1.90 |
| 9 | Genitourinary disease | 1.09 | Mental disease | 0.60 | Genitourinary disease | 1.32 | Genitourinary disease | 1.07 |
| 10 | Complications of pregnancy | 0.86 | Congenital disease | 0.27 | Congenital disease | 0.74 | Nervous system disease | 0.79 |

plague since 1949 and no cases of typhus since 1986. Other infectious diseases, such as rabies, leptospirosis, dengue, whooping cough, meningococcal meningitis, Japanese encephalitis, malaria, and measles are on the verge of being eliminated.

While the majority of infectious diseases appear to be under control, a number of challenges have emerged. The incidence rates of syphilis and gonorrhea rose from 1.49 per 100 000 and 73.11 per 100 000, respectively, in 1994 to 27 per 100 000 and 229.52 per 100 000 in 1998, making these sexually transmitted diseases the leaders among infectious diseases. As for tuberculosis, the incidence rate had been declining since 1990, but since 1995 it has increased (17.3 per 100 000 in 1990, 12.8 per 100 000 in 1995, and 15 per 100 000 in 2000). Also, the number of cases of HIV/AIDS has increased (9 cases in 1990, 42 cases in 1995, and 106 cases in 2001). Clearly, significant health resources will be needed to combat these and other emerging infectious diseases, for example, severe acute respiratory syndrome (SARS). (Statistical data in paragraphs 3–6 are from the unpublished Shanghai Municipal Center for Disease Control and Prevention Summary Report on the Disease Surveillance and Vital Statistics in Shanghai, 1951–2002).The reporting system has been unified for several decades in Shanghai. By law, mortality due to infectious diseases and chronic diseases has to be reported to the Central Vital Statistics Office. Coding of causes of death has been based on the *International Classification of Diseases, 9th Revision,*[3] since 1988.)

## ESTABLISHMENT OF THE SHANGHAI CDC

With an increase in life expectancy, increased burden due to chronic diseases, and the challenges of emerging infectious diseases in the municipality, the Shanghai Municipal Health Bureau reexamined the public health infrastructure in Shanghai and saw the need for a new public health agency to address the many health issues associated with these changes. The rationale is that prior to 1998 public health in China, and in the Municipality of Shanghai, was the responsibility of dozens of disparate institutes, centers, agencies, bureaus, and departments, organized around individual diseases or clusters of traditional disease categories. These organizations, in turn, were originally founded on traditional perspectives of disease etiology and corresponding courses of treatment and prevention. The different organizations adapted independently to changes in technology and science, and the boundaries of disease categories were unclear, resulting in overlapping and sometimes conflicting mission statements and agency mandates.

Different models of public health structures, including those of the United States, Europe, Russia, Japan, and Singapore, were studied. Among them, the US model is outstanding because the US CDC is widely recognized as one of the world's premier public health institutions.[4] Its strength is its emphasis on prevention, accomplished by the skillful use of 2 scientific disciplines: epidemiology and laboratory science. The US CDC grew from its original mission of engaging in the control of a single disease (malaria) to its current mandate of dealing with not only all infectious diseases but also many chronic diseases, occupational disorders, violence, and accidents. Historically, the US CDC has played a vital role in reducing the threat of communicable diseases in the United States and the world.

To minimize overlapping of functions and to increase efficiency, the Shanghai Municipal Health Bureau consolidated 7 existing institutions—the Shanghai Epidemic Prevention Station, the Shanghai Institute of Parasitic Diseases, the Shanghai Tuberculosis Control Center, the Shanghai Institute of Sexually Transmitted Diseases and Skin Disease, the Shanghai Office of Tumor Control, the Shanghai Office of Cardiovascular Disease Control, and the Shanghai Institute of Industrial Hygiene and Occupational Diseases—into a new agency: the Shanghai CDC.

## GOALS, STRUCTURES, AND FUNCTIONS OF THE SHANGHAI CDC

The goal of the Shanghai CDC is to provide a central public health organization with integrated responsibility for community and individual health needs. Its chief mission is to

make recommendations for public health policy and planning for Shanghai. It conducts surveillance and collects health information; it performs preventive medicine research with the aim of health intervention; and it provides training and health care services. It is believed that through actions such as setting up cooperative networks at the municipal level, implementing chronic disease prevention strategies, preventing and controlling the leading and emerging infectious diseases, carrying out the injury prevention and control initiatives, addressing environmental and occupational health issues, and strengthening comprehensive surveillance, the Shanghai CDC will have an impact on disease prevention in Shanghai.

The Shanghai CDC carries out its functions through 5 core departments: (1) Control and Prevention of Infectious Diseases, (2) Control and Prevention of Chronic Diseases, (3) Environmental and Occupation Health, (4) Preventive Health Care Service, and (5) Public Health Laboratory. It partners with various hospitals and medical universities for clinical research. It also works with academic associations, experts, and volunteers in all health fields. On the international level, it collaborates with many different organizations, among them the World Health Organization, the World Bank, the United Nations International Children's Emergency Fund, the European Union, the US Centers for Disease Control and Prevention, the US National Institutes of Health, the State of California Department of Health Services, and the University of Toronto in Canada.

## CONCLUSION

During the past 2 decades, China has been undergoing the process of economic reform and has been relatively successful. In order to be efficient, health care service should be reformed to suit the market economy. Since public health strategy is essential to health care reform, the need to create an efficient public health structure is evident. In 1998, the Shanghai Municipal Bureau, using the US CDC as a model but adapting it to the Chinese system,[5] undertook the challenge of reorganizing public health structures in Shanghai. The immediate impact of consolidating 7 previous institutions into a single agency—the Shanghai CDC—is more efficient allocation of resources and management of programs in public health. For example, with laboratory facilities concentrated under one roof, cost savings are substantial. Further, responsibilities for disease control are less overlapping and confusing, thus facilitating coordination in program planning, emergency response, and public communication.

Since the establishment of the Shanghai CDC, several programs have been initiated. For example, a model program has been created that transforms the traditional clinically based community hospitals into community-based health promotion and disease prevention health service centers. An emergency response system for bioterrorism has also been established. Periodic monitoring and evaluation will be needed to ensure the effectiveness of these programs.

In Shanghai, as well as in other parts of China, a dramatic shift in the nature of disease patterns; the interaction of environmental, genetic, social, and cultural factors; and the effectiveness of prevention strategies call for reorientation of public health structures. The establishment of organizations such as the Shanghai CDC to deal with changing disease patterns is part of public health reform, with the goal of improving quality of life for the public. ■

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### References

1. World Health Organization. 2003. Available at: http://www.who.int/country/chn/en. Accessed April 17, 2003.

2. Vaupel JW, Carey JR, Christensen K, et al. Biodemographic trajectories of longevity. *Science.* 1998;280:855–860.

3. *International Classification of Diseases, 9th Revision.* Geneva, Switzerland: World Health Organization; 1980.

4. Etheridge EW. *Sentinel for Health: A History of the Centers for Disease Control.* Berkeley: University of California Press; 1992.

5. Zhang SN, Chen ATL, eds. *March on With Health—Introduction of CDC* [in Chinese]. Shanghai, China: Wenhui Press; 2001.